

# Algebra/Topology Seminar

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## DECOMPOSING THE PERSISTENT HOMOLOGY TRANSFORM OF STAR-SHAPED OBJECTS

Thursday, October 17, 2024

3:00 p.m. in BB-B012

**ABSTRACT.** In this talk, we study the geometric decomposition of the degree-0 Persistent Homology Transform (PHT) as viewed as a persistence diagram bundle. We focus on star-shaped objects as they can be segmented into smaller, simpler regions known as “sectors”. Algebraically, we demonstrate that the degree-0 persistence diagram of a star-shaped object in  $\mathbb{R}^2$  can be derived from the degree-0 persistence diagrams of its sectors. Using this, we then establish sufficient conditions for star-shaped objects in  $\mathbb{R}^2$  so that they have “trivial geometric monodromy”. Consequently, the PHT of such a shape can be decomposed as a union of curves parameterized by  $S^1$ , where the curves are given by the continuous movement of each point in the persistence diagrams that are parameterized by  $S^1$ . Finally, we discuss the current challenges of generalizing these results to higher dimensions.